

WHAT IS CLAIMED AS NEW AND DESIRED TO BE SECURED BY LETTERS
PATENT OF THE UNITED STATES IS:

Sub # 7
54
5 1. An elevator comprising:
a movable unit configured to ascend and descend in an elevator shaft;
a guide rail installed on said elevator shaft via a plurality of rail support members and
configured to guide said movable unit;
a cable configured to hang said movable unit;
a driving unit mounted on said guide rail and configured to move said movable unit
up and down by driving said cable; and
at least one of said rail support members fixed to a wall of said shaft by means of at
least two securing members separated from each other by an interval in the vertical direction.

2. The elevator as recited in claim 1, wherein:
at least one of said rail support members adjacent to said driving unit is fixed by said
at least two securing members.

15 3. The elevator as recited in claim 1 or 2, wherein said securing members comprise
upper and lower pairs of anchor bolts, each pair of said anchor bolts being separated by an
interval in the horizontal direction.

4. The elevator as recited in claim 3, wherein:
W is a load applied to one end of said rail support members at which said guide rail is
20 connected,

h is a distance between said shaft wall and said guide rail,
f is a maximum permissible tensile strength of an uppermost of said securing
members,

n is the number of lines of said securing members,

L is a distance of said interval, and

$$(W_h)/(2fn) \leq L \leq (W_h)/(fn).$$

5. An elevator comprising:

a movable unit configured to ascend and descend in an elevator shaft;

a guide rail installed on said elevator shaft via a plurality of rail support members and
configured to guide said movable unit;

a cable configured to hang said movable unit;

a driving unit mounted on said guide rail and configured to move said movable unit
up and down by driving said cable; and

supporting means for attenuating a bending moment existing
at at least one of said support members.

6. The elevator as recited in claim 5, wherein:

said supporting means are attached to at least said rail support members adjacent to
said driving unit.

7. The elevator as recited in claim 5, wherein said supporting means comprise:

a pivot member connecting a respective support member to said guide rails.

8. An elevator comprising:

a movable unit configured to ascend and descend in an elevator shaft;

a guide rail installed on said elevator shaft via a plurality of rail support members and configured to guide said movable unit;

a cable configured to hang said movable unit;

a driving unit mounted on said guide rail and configured to move said movable unit up and down by driving said cable; and

a beam fixed on said elevator shaft with an upper end of said guide rail secured to said beam.

9. An elevator comprising:

a movable unit configured to ascend and descend in an elevator shaft;

a guide rail installed on said elevator shaft via a plurality of rail support members and configured to guide said movable unit;

a cable configured to hang said movable unit; and

a driving unit mounted on said guide rail and configured to move said movable unit up and down by driving said cable;

said guide rail being slidably supported by said rail support members and standing on the bottom of said shaft.

10. An elevator comprising:

a movable unit configured to ascend and descend in an elevator shaft;

a guide rail installed on said elevator shaft via a plurality of rail support members and configured to guide said movable unit;

a cable configured to hang said movable unit;

a driving unit mounted on said guide rail and configured to move said movable unit up and down by driving said cable; and

an elastic member coupled to respective of said rail support members and configured to attenuate vibration caused by said driving unit.

11. An elevator comprising:

a movable unit configured to ascend and descend in an elevator shaft;

a guide rail installed on said elevator shaft via a plurality of rail support members and configured to guide said movable unit;

a cable configured to hang said movable unit;

a driving unit mounted on said guide rail and configured to move said movable unit up and down by driving said cable; and

a damper member attached to at least one of said rail support members or said guide rail and configured to attenuate vibration caused by said driving unit.

12. The elevator as recited in claim 11, wherein:

said damper member is attached to at least said rail support members adjacent to said driving unit or to said guide rail near said driving unit.

13. The elevator as recited in claim 11, wherein:

said guide rail comprises a plurality of rails being connected together by connecting plates; and

said damper member comprises at least one of said connecting plates made of highly damped steel.

5 14. The elevator as recited in claim 11, wherein:

said guide rail comprises a plurality of rails connected together; and
at least one said rail is made of highly damped steel.

15. The elevator as recited in claim 11, wherein:

said damper member comprises an active damper.

10 16. The elevator as recited in claim 11, wherein:

each of said rail support members comprises a bracket connected at one end thereof to said guide rail, and a plate secured at one end thereof to a wall of said elevator shaft and at another end thereof to another end of said bracket; and

15 said damper member comprises a highly damped steel disposed between said bracket and said plate.

17. The elevator as recited in claim 11, wherein:

each of said rail support members comprises a bracket connected at one end thereof to said guide rail, and a plate secured at one end thereof to a wall of said elevator shaft and at another end thereof to another end of said bracket; and

at least one of said bracket and said plate is made of highly damped steel.

18. The elevator as recited in claim 11, wherein:

each of said rail support members comprise a bracket connected at one end thereof to said guide rail, and a plate secured at one end thereof to said shaft wall and at another end thereof to another end of said bracket; and

said damper member comprises an active damper attached to the bracket or the plate of at least one of said rail support members.

19. An elevator comprising:

a movable unit configured to ascend and descend in an elevator shaft;

a guide rail installed on said elevator shaft via a plurality of rail support members and configured to guide the movable unit;

a cable configured to hang said movable unit;

a driving unit mounted on said guide rail and configured to move said movable unit up and down by driving said cable;

a coupling member configured to connect at least two rail support members adjacent to said driving unit together; and

said coupling member being secured to a wall of said elevator shaft by at least two securing members separated from each other by an interval in the vertical direction.

20. The elevator as recited in claim 19, further comprising:

a damper member attached to one of said rail support members connected together by said coupling member and configured to attenuate vibration caused by said driving unit.

21. The elevator as recited in claim 19, further comprising:

an elastic member disposed at a coupling portion of one of said rail support members
5 and said coupling member.

22. The elevator as recited in claim 19, further comprising:

highly damped steel lying at a coupling portion of one of said rail support members
and said coupling member.

23. The elevator as recited in claim 19, wherein:

at least one of said coupling member and said rail support members connected
together by said coupling member is made of highly damped steel.

24. The elevator as recited in claim 20, wherein:

said damper member comprises an active damper.

25. An elevator comprising:

a movable unit configured to ascend and descend in an elevator shaft;
a guide rail installed on said elevator shaft via a plurality of rail support members and
configured to guide said movable unit;
a cable configured to hang said movable unit; and

wherein flexural rigidity of said rail support members adjacent to said driving unit is stronger than that of the rest of said rail support members.

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